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Rocky Mountain Research Station

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Mulch Matters: Mulching fuels treatments promoted understory plant communities in Colorado forests

Mulching fuels treatments have been increasingly implemented by forest managers in the western United States to reduce crown fire hazard. These treatments use heavy machinery to masticate or chip unwanted shrubs and small-diameter trees and broadcast the mulched material on the ground. Because mulching treatments are relatively novel and have no natural analog, their impacts above and beyond crown fire hazard reduction are poorly understood. Rocky Mountain Research Station Research Ecologist Paula Fornwalt and her team initiated a long-term study in 2007 to better understand how mulching fuels treatments impacted understory plant communities in

KEY FINDINGS

- Overall, mulching treatments in three Colorado conifer forest types promoted denser and more diverse native understory plant communities, particularly over the longer-term.
- The positive effect of mulching on understory plants was largely driven by the response of herbaceous plants; shrubs showed little response to mulching treatments.
- Exotic plants tended to be more common in mulched stands than in untreated stands.
- While understory plants in mulched stands could be heavily suppressed in localized areas where mulch contributed to a deep forest floor, these areas were rare.

Researchers found that mulching fuels treatments promoted denser and more diverse understory plant communities in mulched (left) versus untreated (right) stands in three Colorado forest types, including in pinyon pine – juniper forests as pictured above (photo pair courtesy of P. Fornwalt).

three Colorado forest types: pinyon pine – juniper (PJ), ponderosa pine and ponderosa pine – Douglas-fir (PP), and lodgepole pine and mixed conifer (LPMC).

Findings from this study were recently published in the journal Forest Ecology and Management. The total diversity and cover of understory plant species in mulched stands 2–4 years posttreatment were either similar to, or greater than, the diversity and cover in untreated stands for the three forest types. By 6–9 years posttreatment, total understory plant diversity and cover in mulched stands were always greater. The increase in total diversity and cover was driven by increases in the diversity and cover of herbaceous plants, as mulching seemed to have little effect on shrub diversity and cover.

While localized forest floor (mulch plus litter and duff) depths in excess of 3 inches in PJ stands, 4 inches in PP stands, and 7 inches in LPMC stands were shown to more-or-less eliminate understory plants, such depths were rarely encountered in treated sites. Excessive forest floor depths were rare, even in stands where most trees were mulched, because of the relatively low productivity of Colorado forests.

Additionally, while exotic plant richness and cover were commonly higher in mulched than untreated stands both 2–4 and 6–9 years posttreatment, understory plant communities remained highly native-plant dominated. Cheatgrass was the most common exotic species in the PJ forest type, but surprisingly, it was as frequently encountered in mulched stands as it was in untreated stands. Meanwhile, Canada thistle was the most common exotic species in the PP and LPMC forest types, and was more frequently encountered in stands than had been mulched than in those that had not.

Ponderosa pine and ponderosa pine – Douglas-fir forests also showed greater diversity and cover in mulched (left) versus untreated (right) stands. (Photo pair courtesy of P. Fornwalt).

FURTHER READING

Battaglia, Mike A.; Rocca, Monique E.; Rhoades, Charles C.; Ryan, Michael G. 2010. Surface fuel loadings within mulching treatments in Colorado coniferous forests. Forest Ecology and Management. 260: 1557–1566. https://www.fs.fed.us/rmrs/publications/surface-fuel-loadings-within-mulching-treatments-colorado-coniferous-forests

Fornwalt, Paula J.; Rocca, Monique E.; Battaglia, Mike A.; Rhoades, Charles C.; Ryan, Michael G. 2017. Mulching fuels treatments promote understory plant communities in three Colorado, USA, coniferous forest types. Forest Ecology and Management. 385: 214–224. https://www.fs.fed.us/rm/pubs_journals/2017/rmrs_2017_fornwalt_p001.pdf

Rhoades, Charles C.; Battaglia, Mike A.; Rocca, M. E.; Ryan, Michael G. 2012. Short- and medium-term effects of fuel reduction mulch treatments on soil nitrogen availability in Colorado conifer forests. Forest Ecology and Management. 276: 231–238. https://www.fs.fed.us/rmrs/publications/short-and-medium-term-effects-fuel-reduction-mulch-treatments-soil-nitrogen

Increased moisture, nutrient and light resources due to tree removal and mulch application seem to explain the post-mulching response by understory plant communities. “There had been concern that broadcasting mulched material on the ground of forests would suppress understory plants, just as it can do in a garden,” Fornwalt explains. “However our research suggests that, in the Colorado forest types we studied, any suppressive effects of the mulch were outweighed by the beneficial effects of increased resources.”

Paula Fornwalt is a Research Ecologist at the Rocky Mountain Research Station and is stationed in Fort Collins, Colorado. Learn more about her research at https://www.fs.fed.us/rmrs/people/pfornwalt.

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